agree (and Mach has shown by experiment) that that retardation would not take place in tubes so small as the actual canals, and hence there is nothing but changes of pressure to fall back upon. Aubert does not obtain the same experimental results as Delage when it is a question of throwing doubt upon the sufficiency of this explanation, and Mach maintains that the change of pressure which would take place is not too inconsiderable to produce the required effect (*Bewegungsempfindungen*, Leipzig, 1875). The work done in hearing the lowest perceptible sounds, according to Töpler and Boltzman, is 1 : 3,000,000,000 of a kilogrammeter per second; in seeing the faintest lights, it is, according to Thomson, 1 : 5,740,000,000; and Mach's calculations show that much more than that would be done in the semi-circular canals. C. L. F.

Zur Physiologie der Bogengänge. J. Rich. Ewald. Pflüger's Archiv, Bd. XLIV, H. 7–8–9.

On opening the bony semi-circular canals of a dove, variations in the level of the perilymph are sometimes to be observed, which have been connected by some observers with the rhythm of the heart. It seemed to Ewald at first that they rather followed respiration, but he later discovered that they were produced by the movements of the lower mandible, which sometimes accompany respiration, and occasionally for a few seconds are as rapid as the pulse. The mandible moves the adjacent parts of the skin, and they the ear-drum, which communicates the motion indirectly to the perilymph. In uninjured canals the changes in the level must be changes of pressure, affecting both perilymph and endolymph, but do not cause sensations of rotation, because the pressure is equal in all the ampullae. The impulses are too few and too gentle to cause sensations of tone or noise, but probably do cause momentary deafness, as yawning does in man.

Bydrage tot de physiologie van den reuk. H. Zwaardemaker. Feestbundel van Donders, 1888, p. 179. Abstract by Heymans, Centralblatt f. Physiol. No. 26, 1889.

Using yellow wax to produce an olfactory stimulus, the author found that 0.1 second elapsed before the odor from a surface of 122 sq. mm. held before the nose was perceived. With smaller surfaces the time was longer (though not shorter with larger ones), and warming the wax quickened its perception. He found also that different odors diffuse themselves in still air at different rates. At a distance of 40 cm. and a temperature of 15° acetic ether was perceived in 4 seconds, sulphuric ether in 9, soap and tallow in 10, paraffine in 18, camphor in 19, yellow wax in 20, turpentine in 22, vulcanized rubber in 45, thus forming a series according to rate of diffusion from the most to the least volatile, the rate depending on the physical peculiarities of the molecules. The author has devised an instrument with which to test the sense of smell, depending on the relation of the area of the exposed surface of the odorous substance to the intensity of the odor. Individuals differ as to acuteness, but for the same person and the same substance the acuteness is constant. The author considers the olfactory stimulus to be a chemico-mechanical one.